



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,643	07/29/2003	Tri-Rung Yew	JCIPP108-C-CP	8271
23900	7590	07/01/2005	EXAMINER	
J C PATENTS, INC. 4 VENTURE, SUITE 250 IRVINE, CA 92618			ANDUJAR, LEONARDO	
			ART UNIT	PAPER NUMBER
			2826	

DATE MAILED: 07/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/630,643

Applicant(s)

YEW ET AL.

Examiner

Leonardo Andújar

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06/06/2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 13-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of species 1 (claims 1-12 and 20) in the reply filed on 06/06/2005 is acknowledged.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 2, 4-6, 9 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. (US 6,245,663) in view of Parikh (US 6,225,207).
4. Regarding claim 1, Zhao (e.g. figs. 4A-I & 7-8M) shows a dual damascene structure for electrically interconnection to a base metal interconnect structure (406, 806) formed in a semiconductor substrate (402, 404, 802, 804), which comprises: a first dielectric layer (402,802) formed from a first low-K organic dielectric material (i.e. Parylene) over the substrate to cover the exposed surface of the base metal interconnect structure (col. 5/lls. 46-51 & col. 6/lls. 30-50); an etch-stop layer (412, 812) formed from a low-K inorganic dielectric material (i.e. silicon oxide, col. 6/ll. 30-50) over the first dielectric layer; a second dielectric layer (820) formed from a second low-K organic dielectric (e.g. Parylene, see col. 6/lls. 51-55) over the etch-stop layer; a protective layer (814) formed between the etch-stop and the second dielectric layer, wherein the protective layer is formed from an inorganic dielectric material having a

Art Unit: 2826

dielectric constant K which is higher than the etch-stop layer (col. 6/II 51- col. 7/II. 18 & col. 8/II. 56-col. 9/II. 13); a metal line (828) formed in the second dielectric layer and the protective layer; and a metal plug (818) connected with the metal line and penetrating successively through the etch-stop layer and the first dielectric layer to come into electrical contact with the base metal interconnect structure in the substrate. Zhao does not disclose that the etch-stop layer is formed from a dielectric material selected from a group consisting essentially of fluorosilicate glass, fluorosilicon oxide, and hydrogen silsesquioxane. Nevertheless, Parikh (e.g. fig. 3G) discloses an etch-stop layer fluorosilicon oxide (col. 8/II. 66-col. 9/II. 21). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the etch-stop layer disclosed by Zhao of fluorosilicon oxide as taught by Parikh since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

5. Regarding claim 2, Parikh teaches that the first and second organic dielectric layer are made of Flare (col. 8/II. 66-67 & col. 9/II. 1-21).

6. Regarding claim 4, Zhao teaches that wherein the first and second organic dielectric layers are made of Parylene (col. 5/II. 45-51 and col. 6/II. 51-55).

7. Regarding claim 5, Parikh teaches that the first and second organic dielectric layers are made of BCB (col. 8/II. 66-67 & col. 9/II. 1-21).

8. Regarding claim 6, Zhao teaches that the protective layer is made of silicon oxide (col. 8/II. 64-65).

Art Unit: 2826

9. Regarding claim 9, Zhao teaches that the dual damascene structure comprises a hard mask layer (822) formed over the second dielectric layer but not covering the metal line.

10. Regarding claim 20, Zhao (e.g. figs. 4A-I & 7-8M) shows a dual damascene structure for electrically interconnection to a base metal interconnect structure (406, 806) formed in a semiconductor substrate (402, 404, 802, 804), which comprises: a first dielectric layer (402, 802) formed from a first low-K organic dielectric material such as Parylene, over the substrate to cover the exposed surface of the base metal interconnect structure (col. 5/lls. 46-51 & col. 6/lls. 30-50); an etch-stop layer (412, 812) formed from a low-K inorganic dielectric material (i.e. silicon nitride, col. 8/lls. 63-64) over the first dielectric layer; a second dielectric layer (820) formed from a second low-K organic dielectric material selected such as Parylene (col. 6/lls. 51-55), over the etch-stop layer; a hard (822) mask layer formed over the second dielectric layer; a protective layer (814 e.g. silicon dioxide, col. 8/ll. 64-65) formed between the etch-stop and the second dielectric layer, wherein the dielectric constant K of the protective layer and the dielectric constant of the etch-stop layer are different; a metal line (828) formed in the second dielectric layer and the protective layer; and a metal plug (818) connected with the metal line and penetrating successively through the etch-stop layer and the first dielectric layer to come into electrical contact with the base metal interconnect structure in the substrate. Zhao does not disclose that the etch-stop layer is formed from a dielectric material selected from a group consisting essentially of fluorosilicate glass, fluorosilicon oxide, and hydrogen silsesquioxane. Nevertheless, Parikh (e.g. fig. 3G)

Art Unit: 2826

discloses an etch-stop layer fluorosilicon oxide (col. 8/ll. 66-col. 9/ll. 21). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the etch-stop layer disclosed by Zhao of fluorosilicon oxide as taught by Parikh since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

11. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. (US 6,245,663) in view of Parikh (US 6,225,207) further in view of Baklanov (US 6,245,489).

12. Regarding claim 3, Zhao in view of Parikh show most aspects of the instant invention including first and second organic dielectric layers. Zhao in view of Parikh does not teach that SILK is a suitable material to make dielectrics layers. Nevertheless, Baklanov teaches that dielectric layers can be made of SILK (col. 6/lls. 61-67). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the first and second organic dielectric layers disclosed by Zhao in view of Parikh of SILK as taught by Baklanov since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

13. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. (US 6,245,663) in view of Parikh (US 6,225,207) further in view of Wang (US 5,679,606)

14. Regarding claims 7 and 8, Zhao in view of Parikh show most aspects of the instant invention including a protective layer. Zhao in view of Parikh does not teach that silicon oxy-nitride and silicon nitride are suitable materials to make protective layers. Nevertheless, Wang teaches that silicon oxy-nitride and silicon nitride are suitable materials to make protective layers (col. 3/lls. 65-67). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use silicon oxy-nitride or silicon nitride to make the protective layer disclosed by Zhao in view of Parikh as taught by Wang since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

15. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. (US 6,245,663) in view of Parikh (US 6,225,207) further in view of Jang et al. (US 6,019,906).

16. Regarding claims 10-12, Zhao in view of Parikh show most aspects of the instant invention including a hard mask. Zhao in view of Parikh does not teach that silicon oxide, silicon oxy-nitride and silicon nitride are suitable materials to make hard masks. Nevertheless, Jang teaches that silicon oxide, silicon oxy-nitride and silicon nitride are suitable materials to make hard masks (col. 8/lls. 45-49). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use silicon oxide, silicon oxy-nitride or silicon nitride to make the hard mask disclosed by Zhao in view of Parikh as taught by Jang since it has been held to be within the general skill of a

Art Unit: 2826

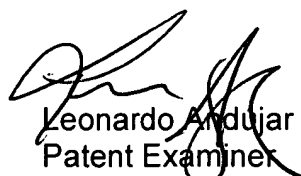
worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

***Conclusion***

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonardo Andújar whose telephone number is 571-272-1912. The examiner can normally be reached on Mon through Thu from 9:00 AM to 7:30 PM EST.

18. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J. Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

19. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Leonardo Andujar  
Patent Examiner  
Art Unit 2826